

Transforming Abandoned Mine Lands into a Botanic Garden

George R. Watzlaf



Hedin Environmental

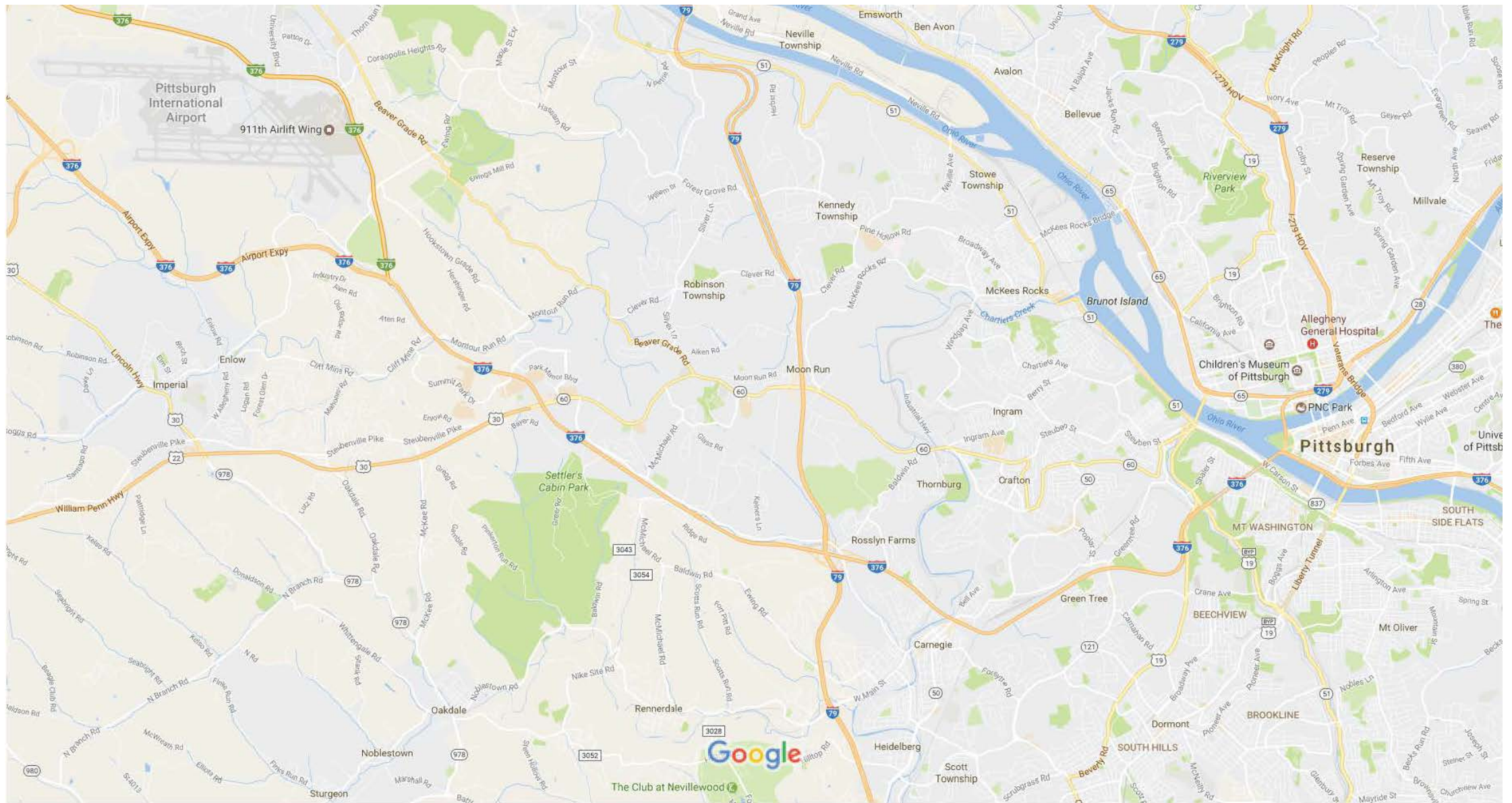
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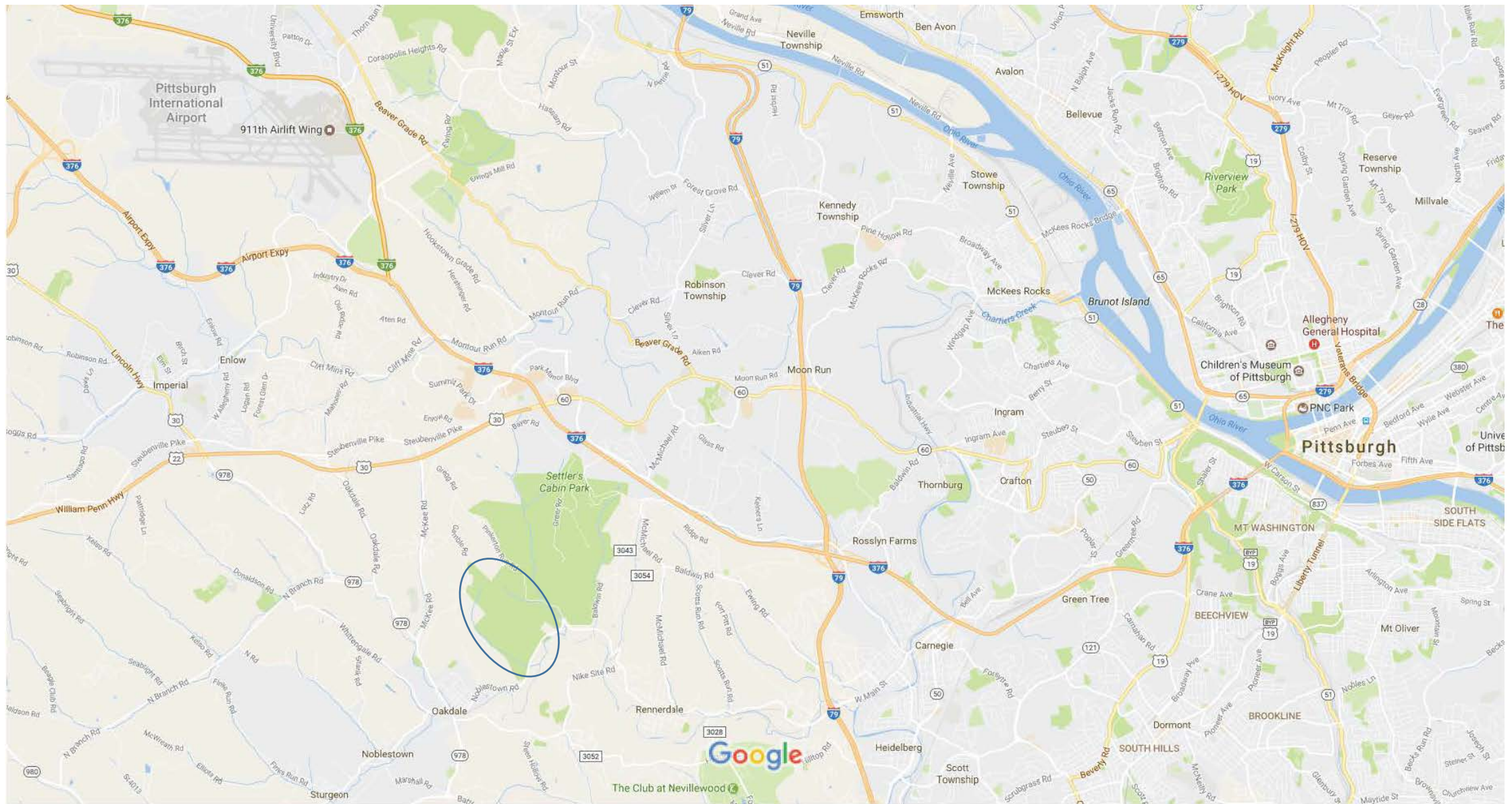
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1988 - Horticultural Society of Western Pennsylvania formed – World-Class Outdoor Botanic Garden



1998 – Settlers Cabin Park – Allegheny County leased 460 acres for 99 years



Map data ©2017 Google 1 mi

1998 – Settlers Cabin Park – Allegheny County leased 460 acres for 99 years





Mining History

- Underground Coal Mining
 - Room and pillar
 - Early 1900s
 - Pittsburgh seam
- Surface Mining
 - Contour mining
 - 1930s and 40s
 - Pittsburgh seam plus rooster
 - Resulted in 6 miles of flat bench area and highwalls









Issues

- Acid mine drainage
- Subsidence holes
- Highwalls
- Mine spoil
- Coal refuse

2004 – Hurricane Ivan

- Flooded abandoned underground mines
- Treatment → Remediation
- Remining

Many AML problems - 4 areas

- Remining/Reclamation
 - 2010 – present
 - ~30 Acres
- Woodlands AMD
 - 2012
 - Treat AMD with Drainable Limestone Bed (DLB)
 - Reestablish pond (Lotus Pond)
 - Separate flush pond
- Abandoned Mine Land Economic Revitalization (AMLER) Pilot Program
 - Reclaim highwalls, subsidence pits, shafts
- Kentucky Hollow AMD
 - Treat AMD with Drainable Limestone Bed (DLB)
 - Stream recovery

Remining/Reclamation

- Reduce AMD
- Eliminate existing highwalls and subsidence pits
- Provide stable ground for visitors center



Panth... Run

Pinkertons Run

3048

Noblestown Rd

3048

Noblestown Rd

3048

Noblestown Rd



Woodlands AMD

- Treat AMD
 - $Q = 4 - 12$ gpm, $pH = 3.2$, Acidity = 143 mg/L, Aluminum = 16.3 mg/L
 - Ideally suited for a DLB
- Reestablish pond with good WQ
- Educational opportunities
 - Visible but not intrusive
- Minimize site disturbance
 - Concrete tank
 - AASHTO #3 LS topped with #9, boardwalk and “removable” landscaping



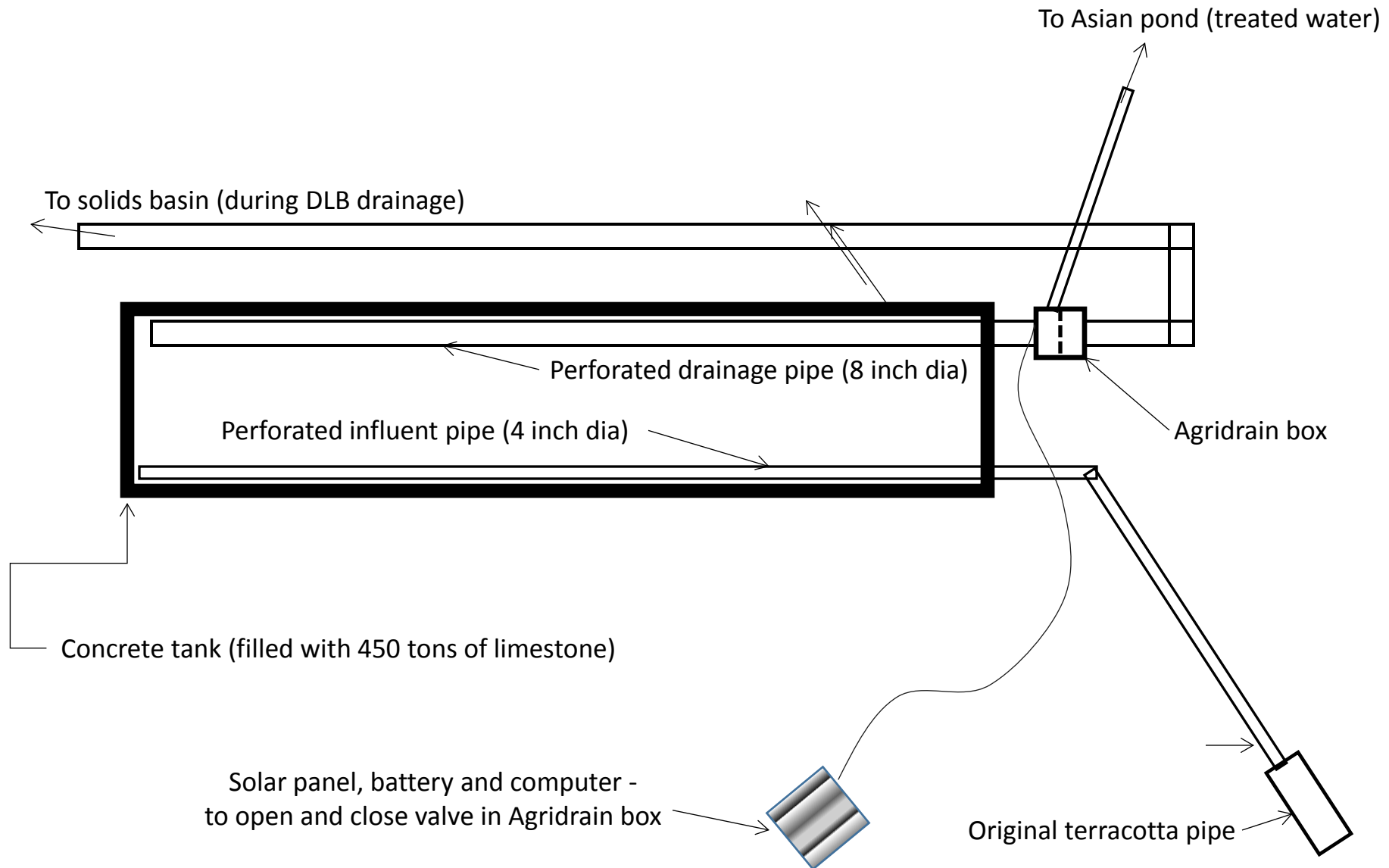








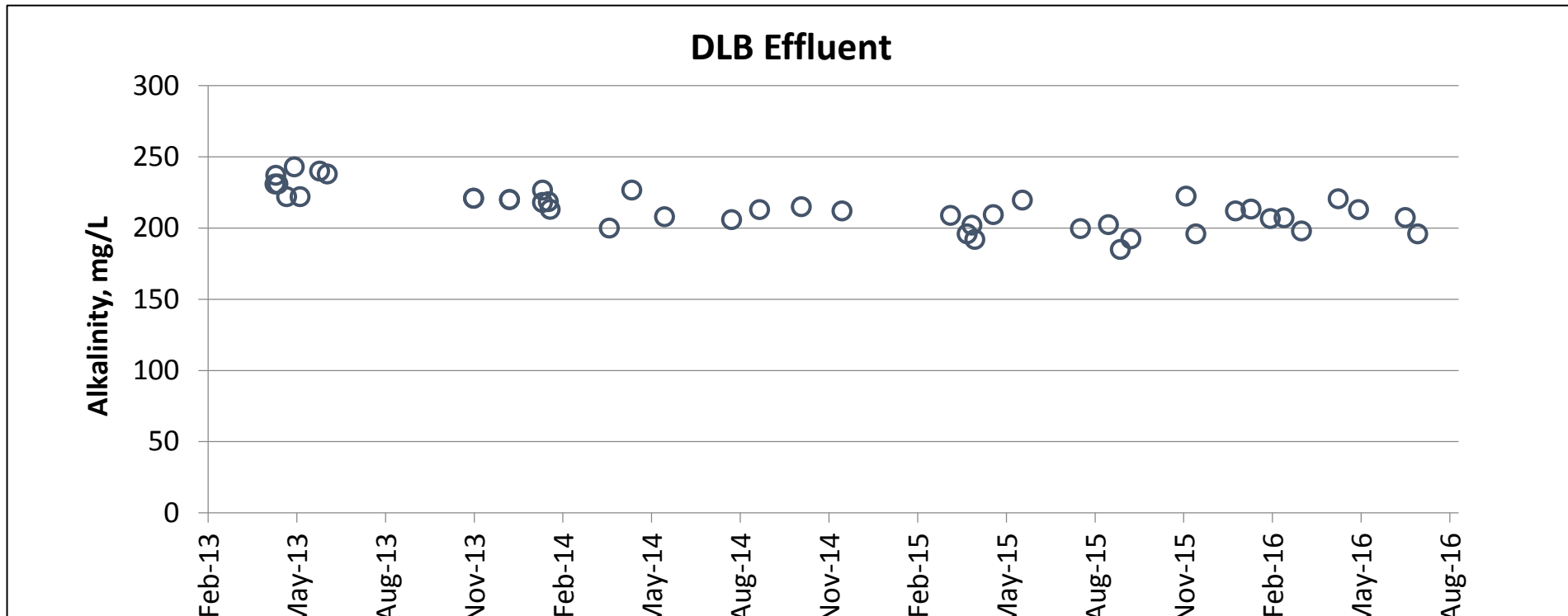
Drainable Limestone Bed (Plan View)





DLB treatment effectiveness has been excellent for over 4 years of operation

	Flow	pH	Alk	Acid	Al	Fe	Mn	SO ₄
	gpm		mg/L CaCO ₃		----- mg/L -----			
Influent	4-12	3.2	0	143	16.3	0.6	0.8	471
Effluent	4-12	6.7	209	-188	0.7	0.1	0.2	508





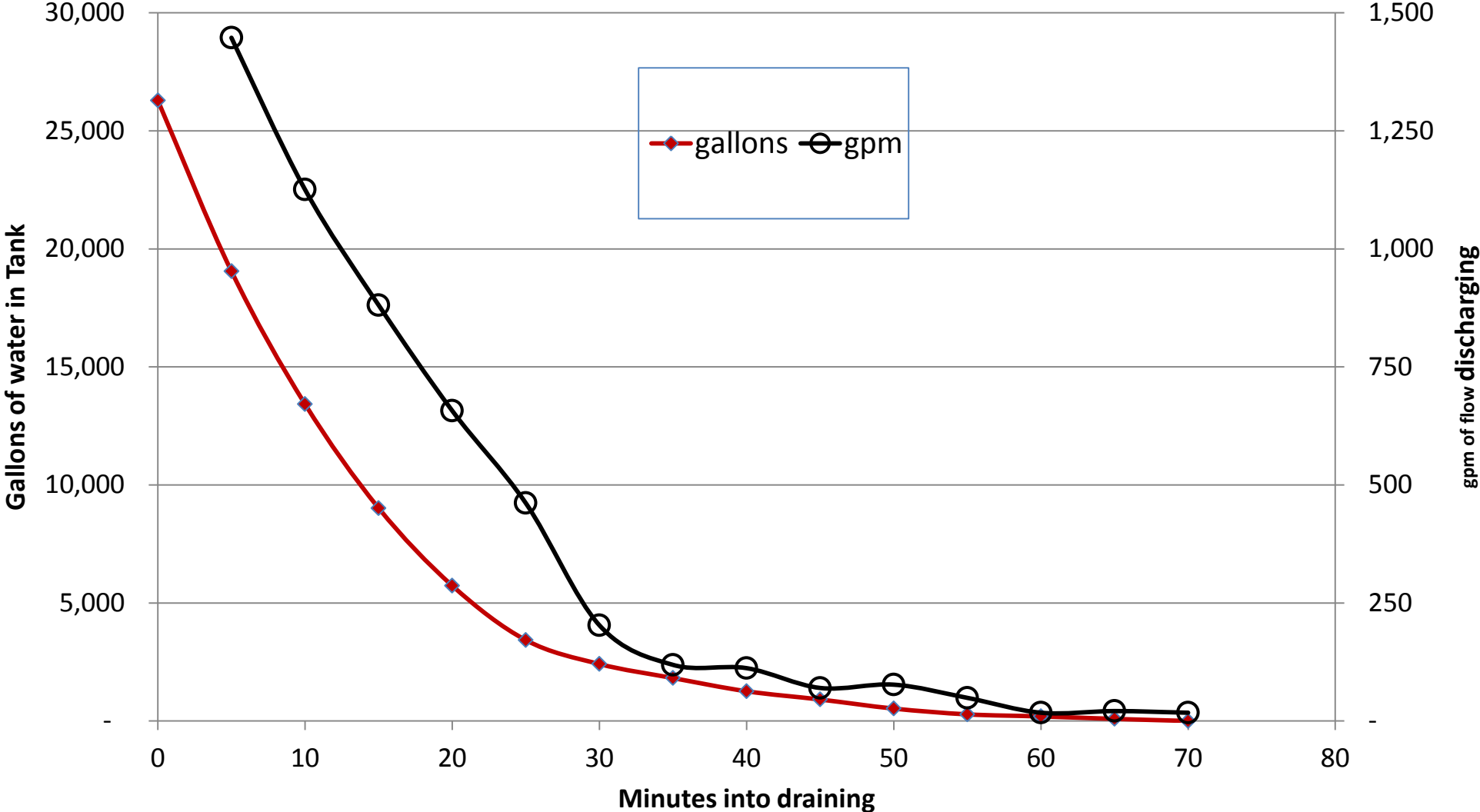
Where's the DLB?





115 ft

Measured water level in DLB during flushing event to determine the flow profile.



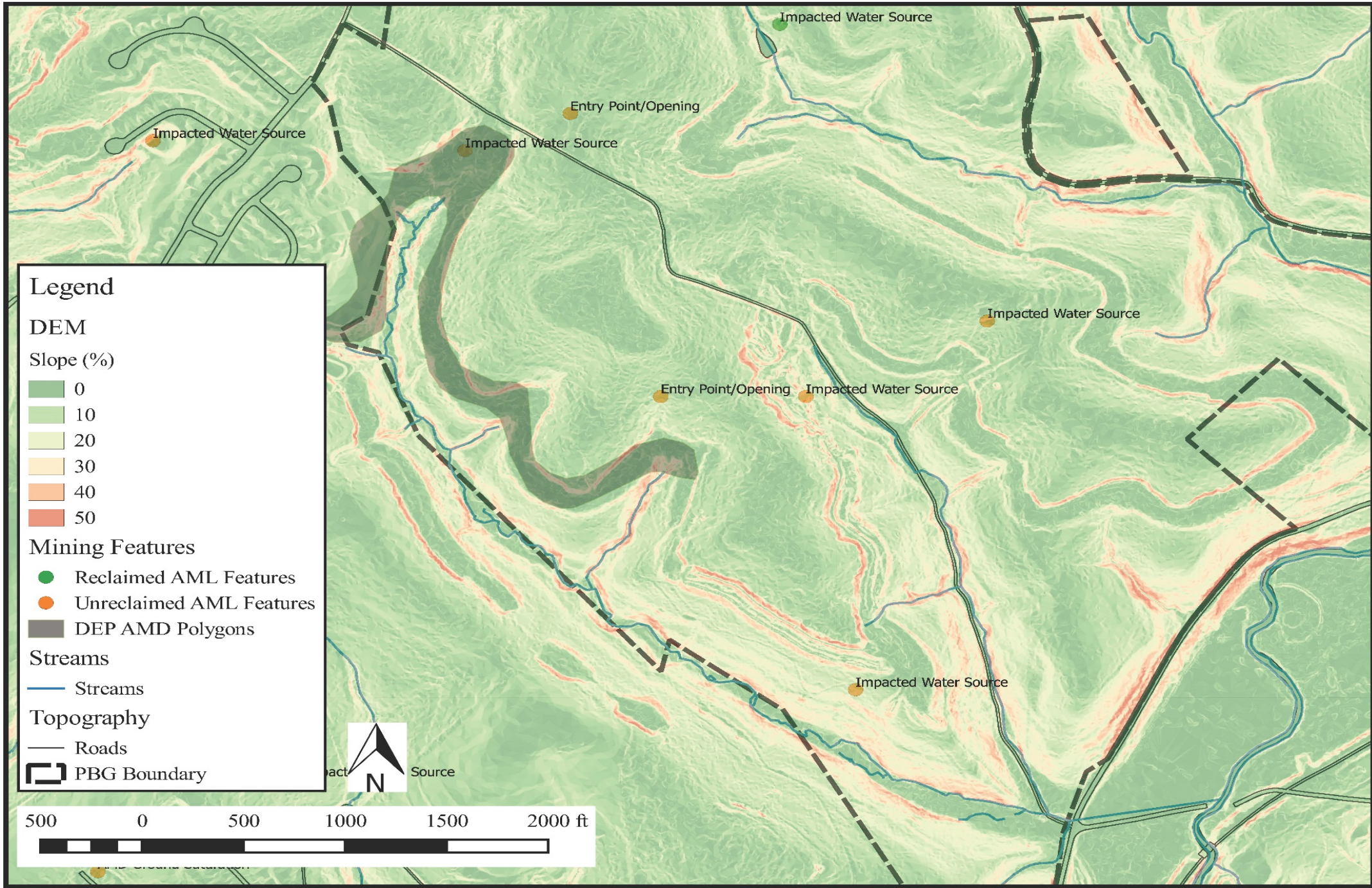
Flushing removed 71% of the aluminum solids that were retained in the past week of treatment. This test was repeated and showed similar results with 70% of aluminum solids flushed out.

Al, Fe, and Mn mass balances for the Woodlands DLB (April 2014)				
	units	Al	Fe	Mn
Normal operations				
Influent	pounds/week	13.80	0.44	0.93
Effluent	pounds/week	0.38	0.09	0.14
Retained	pounds/week	13.42	0.35	0.79
Draining Event				
Total removed	pounds	9.49	0.35	0.10
% removed	pounds	71%	99%	13%
% retained	pounds	29%	1%	87%



Abandoned Mine Land Economic Revitalization (AMLER) Pilot Program

- proposes to accelerate the disbursement of \$1 billion, over 5 years, from unappropriated balances in the Abandoned Mine Reclamation Fund (Fund) to States and Tribes to build new development opportunities and new jobs in communities impacted by abandoned mine lands. This \$1 billion of AML funding is in addition to the AML grants already provided to States under existing law. The accelerated AML funding would be used by States and Tribes for the reclamation of abandoned coal mine land sites and associated polluted waters in a manner that promotes economic diversification and development in economically distressed coal country communities.



Legend

DEM

Slope (%)

- 0
- 10
- 20
- 30
- 40
- 50

Mining Features

- Reclaimed AML Features
- Unreclaimed AML Features
- DEP AMD Polygons

Streams

- Streams

Topography

- Roads
- PBG Boundary

500 0 500 1000 1500 2000 ft



Source



Entry Point/Opening

Impacted Water Source

Impacted Water S

Entry Point/Opening

Impacted Water Source

-Total area with AML features:
~66 acres
-Subsidence is common behind highwalls from only one strip cut.
-Subsidence is not common behind highwalls from two strip cuts. But highwalls at these locations are higher and steeper.

Legend

DEM

Slope (%)

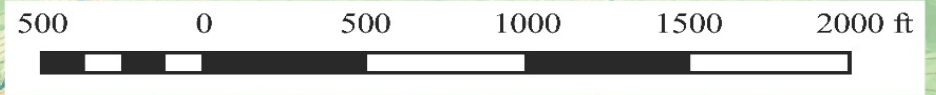
- 0
- 10
- 20
- 30
- 40
- 50

Mining Features

- Unreclaimed AML features
- Reclaimed AML Features
- ▬ AML Features
- ▨ Surface mine extent (approximate)
- ▭ Sediment Ponds

Misc.

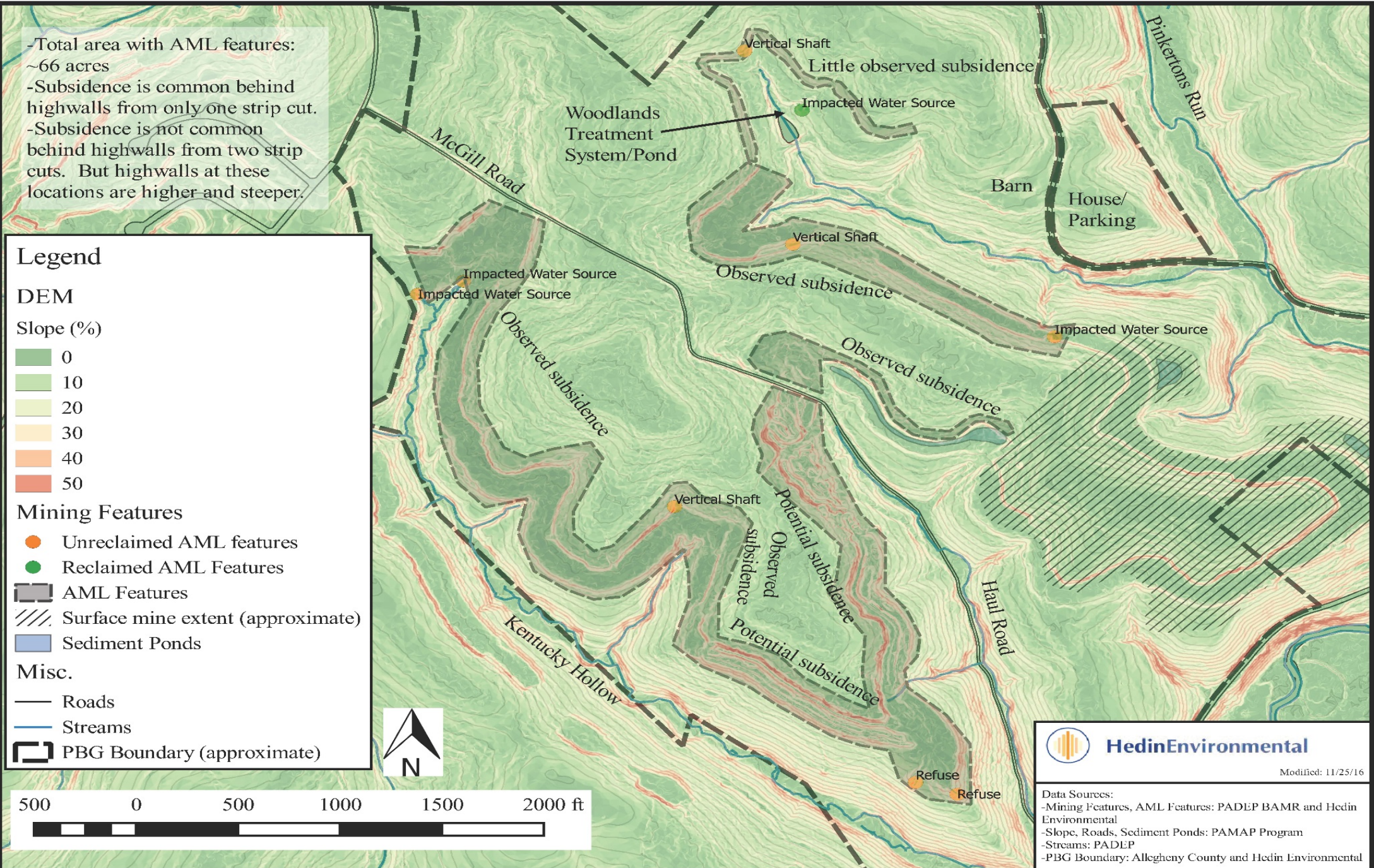
- Roads
- Streams
- ▭ PBG Boundary (approximate)



HedinEnvironmental

Modified: 11/25/16

Data Sources:
-Mining Features, AML Features: PADEP BAMR and Hedin Environmental
-Slope, Roads, Sediment Ponds: PAMAP Program
-Streams: PADEP
-PBG Boundary: Allegheny County and Hedin Environmental



Funding granted to address:

- 7,100 linear feet of highwall
- 27 acres of spoil
- 2 coal refuse piles
- 30 subsidence pits
- 3 vertical shafts
- Enlarge/Relocate Woodlands
flush pond



Identified AML features overlain on Pittsburgh Botanic Garden Plans

Legend

Mining Features

- AML Features
- AML Areas
- Sediment Ponds

Master Plan

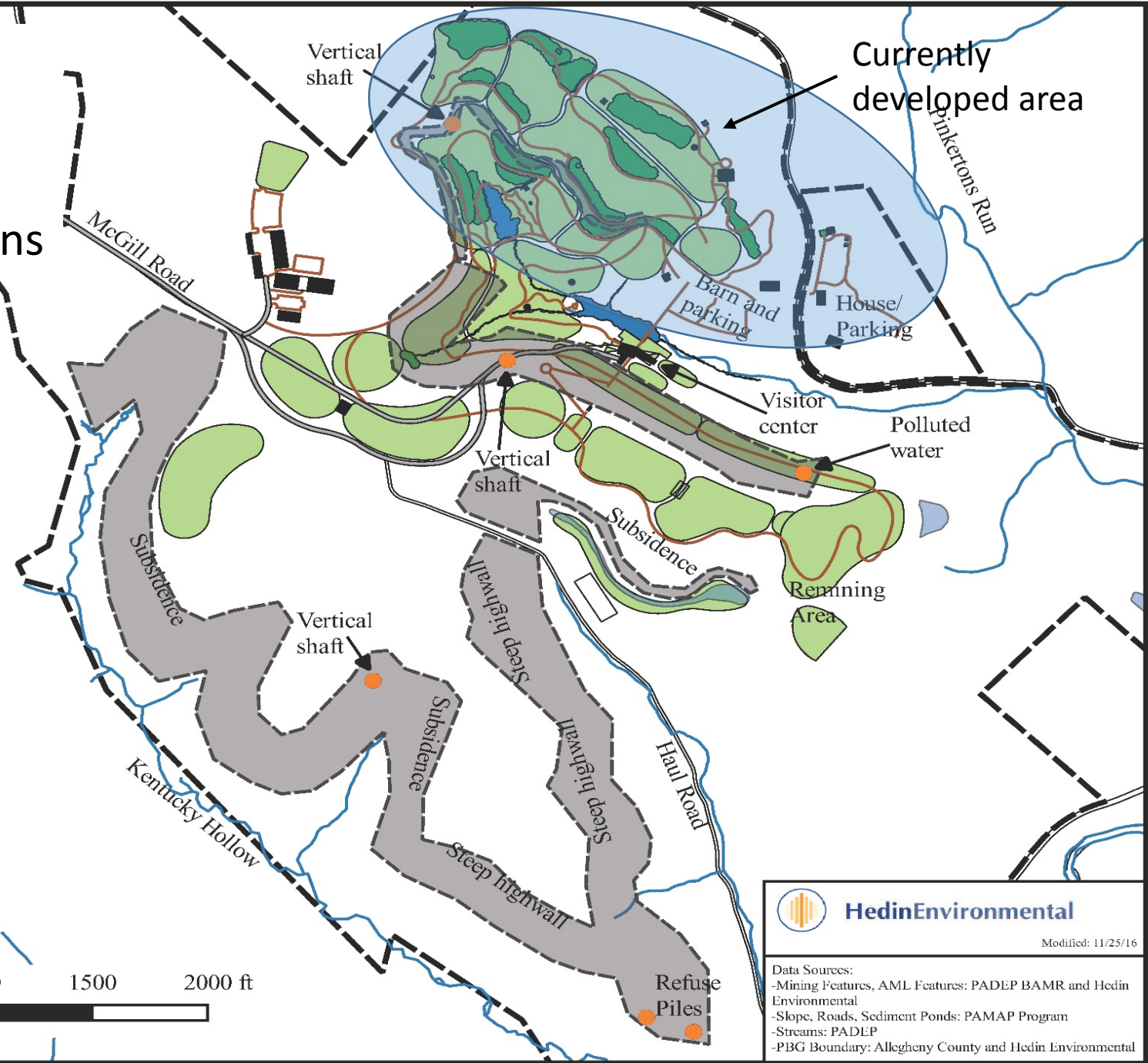
- Features
- Gardens
- Paths
- Water
- Buildings
- Roads

Misc.

- Roads
- Streams
- PBG Boundary (approximate)

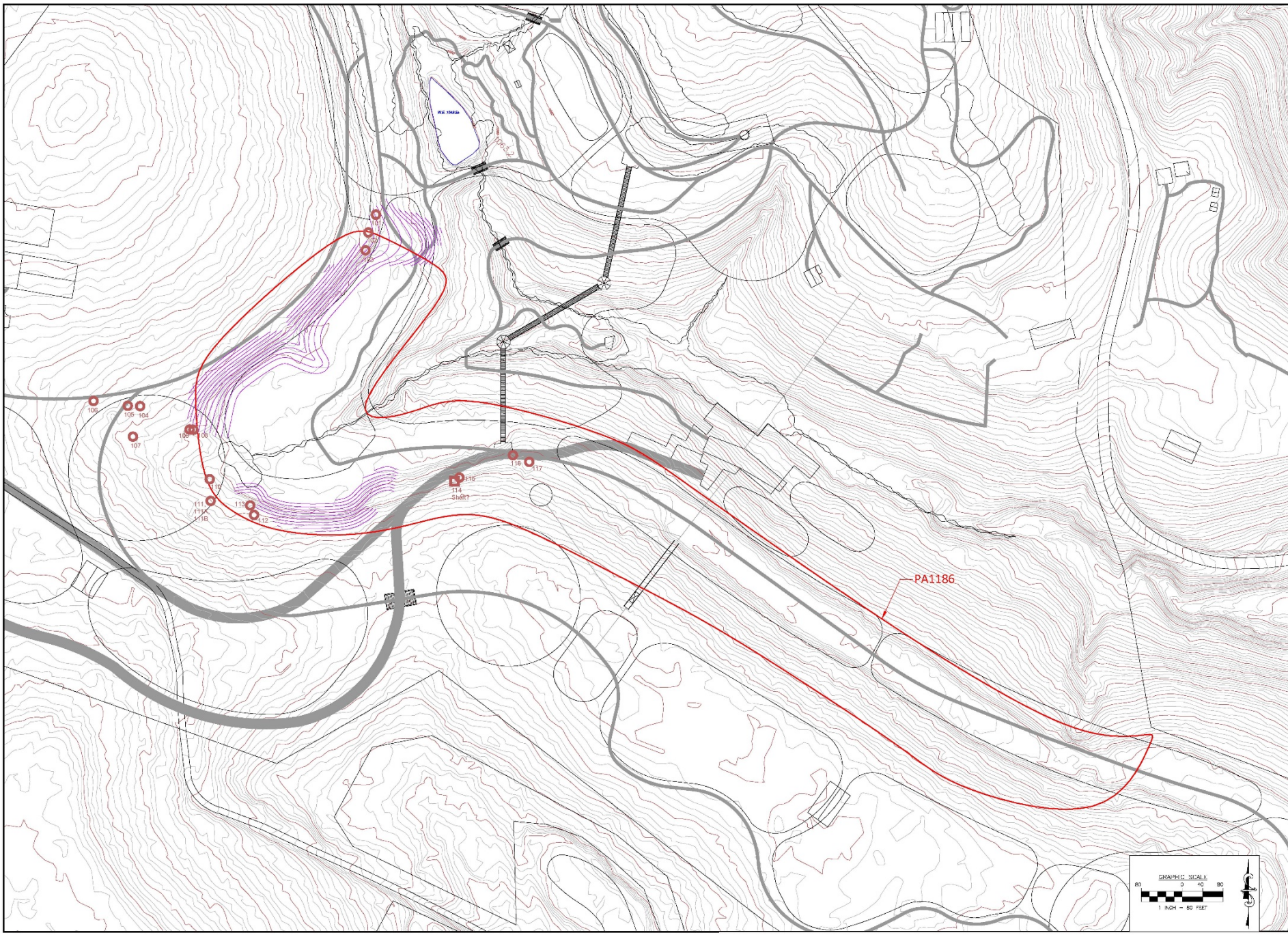


500 0 500 1000 1500 2000 ft



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LEGEND:

No.	Drawn	Description	By

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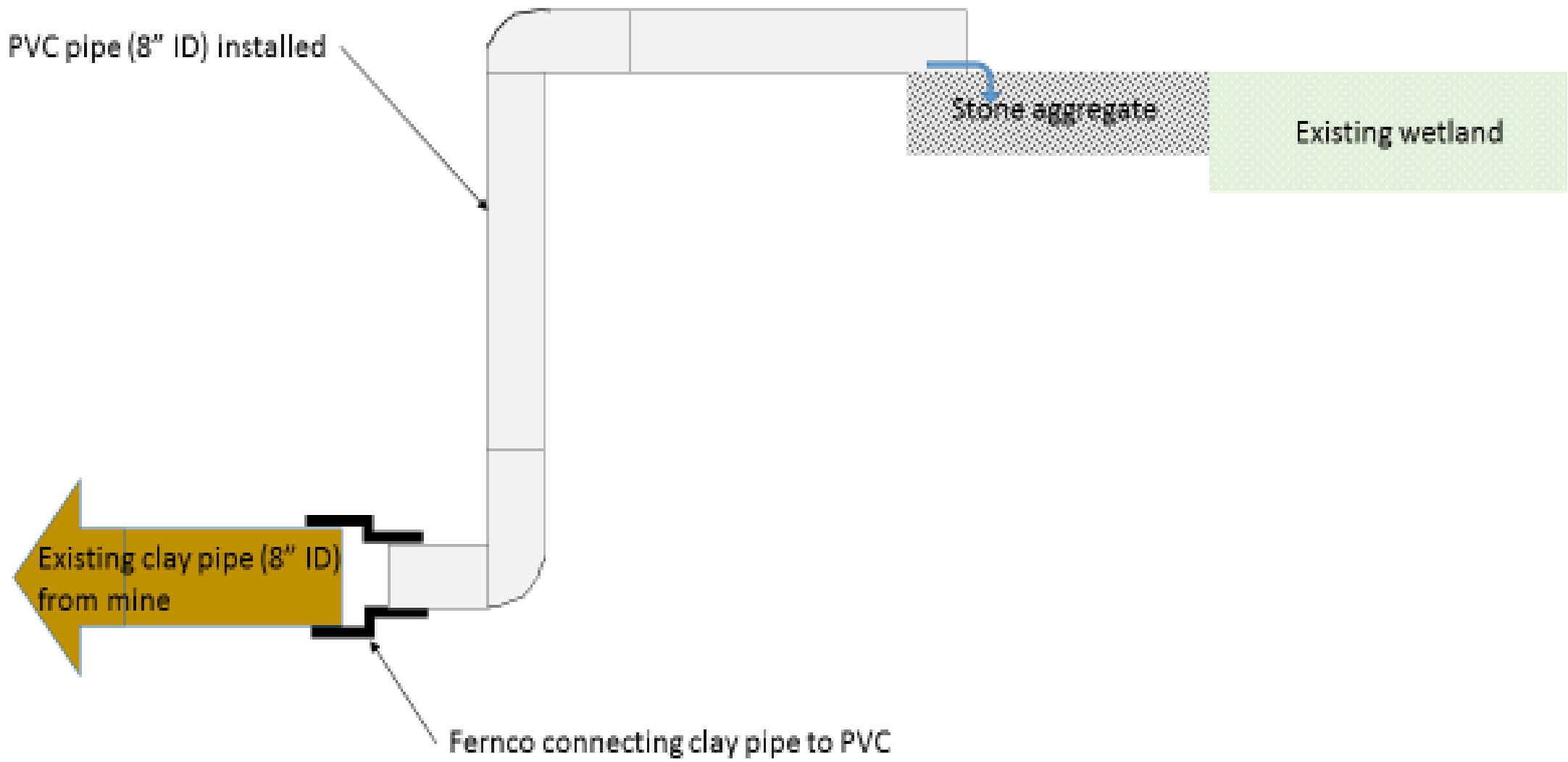
Cove Forest Reclamation Project
AML Features and
Concept Grading plan
 DATE: 05/20/2017
 DRAWN BY: MJC
 CHECKED BY: MJC
 PROJECT: Cove Forest
 COUNTY: Allegheny
 TOWNSHIP: North Fayette Twp.
 PROJECT NO: 15070017

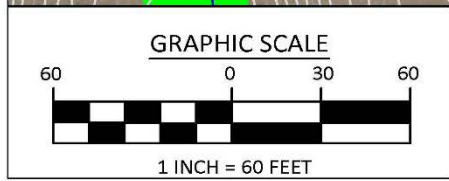
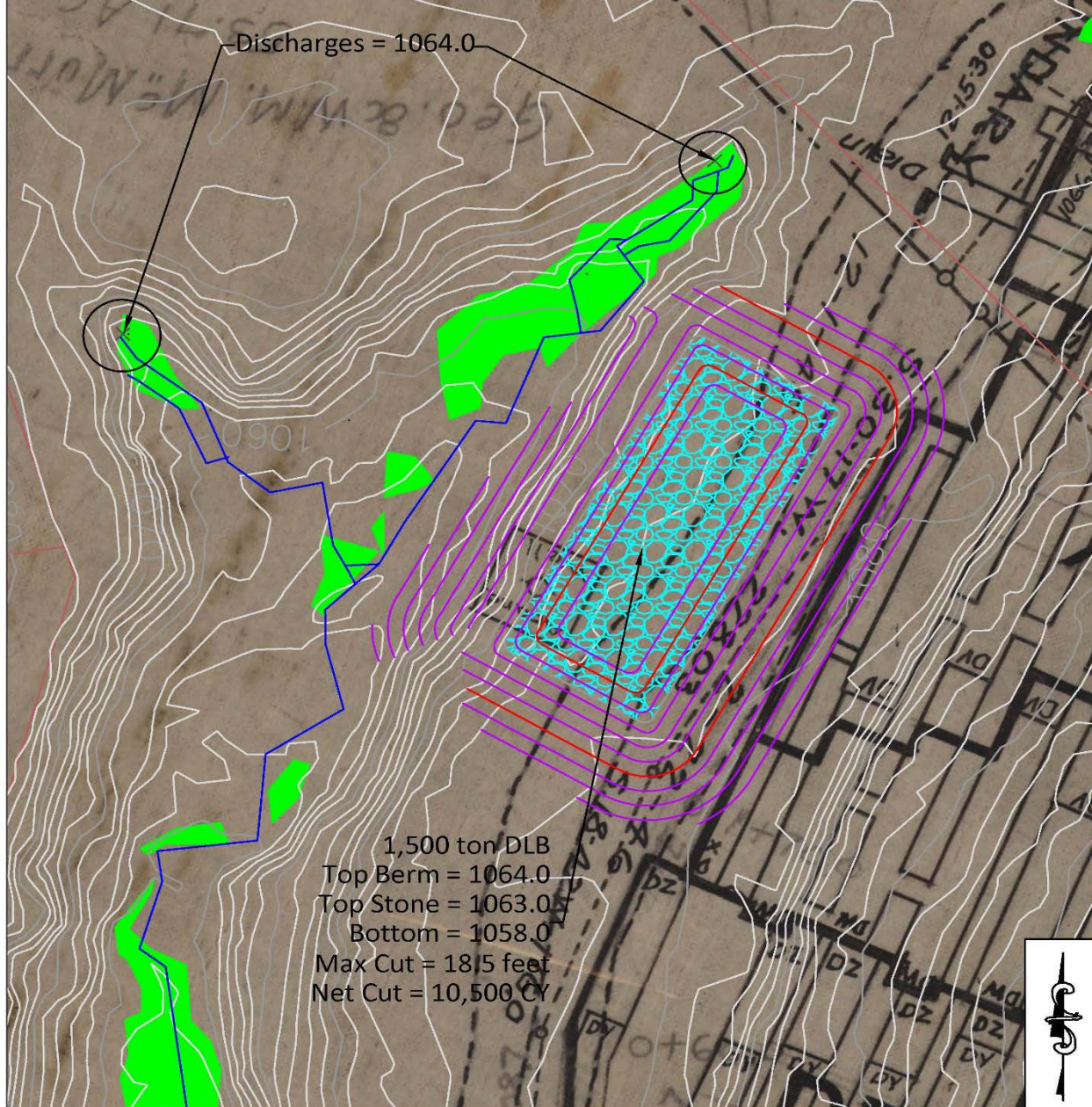
Kentucky Hollow AMD

- Treat AMD from two discharges
 - Q = 40 gpm, pH = 3.3, Acidity = 140 mg/L, Aluminum = 19.2 mg/L
 - Ideally suited for a DLB
- Recover > 6000 feet of steam
- Educational opportunities









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Concept DLB		
Kentucky Hollow AMD Treatment System		
MUNICIPALITY: North Fayette	DATE: December 2016	FILE NAME: KY Hollow.dwg
COUNTY: Allegheny	DRAWN BY: NAW	SCALE: AS SHOWN



PITTSBURGH
BOTANIC GARDEN

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In the case of a life-threatening emergency, please call 911 directly and tell the dispatcher that you are at the Pittsburgh Botanic Garden. Then, call the above number to inform the Garden of the situation.





